3 . The secondary production cycle of the herbivorous zooplankton

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1. Results of the zooplankton surveys

1.1. Zone 1-3

1.1.1. Seasonal variations of zooplankton biomass

The numerous samples taken in 1974 allow us to picture the seasonal evolution of the zooplankton (fig. 1) . We have observed a classical curve with two peaks : the first one has its maximum at the beginning of May ; the second one in September . We also have drawn the maximal and minimal biomass curves , given the variability of the individual biomass in each species . The same work has been done for the earlier years . The different points , but for two , fall within the ~~minimum~~ confidence limits calculated for 1974 .

1.1.2. The qualitative composition and related quantitative aspects

If one studies in detail this biomass composition , one sees that the different peaks are mostly composed with all the development stages of copepods : nauplii , copepodites and adults have their maximum at the same time (7th May) . Most organisms of the first peak belong to the species Temora longicornis and to a lesser extent to the species Acartia clausi . Nauplii have not been determined . This composition remained the same during all the time of the peak (April and May) . Since the different development stages are simultaneously appearing instead of succeeding to each other , we think that water motions have interfered with our observations (see discussion in chap. 7a) . The same phenomena are observed in zone 2 .

1.2. Zone 1-N

1.2.1. Seasonal variations of zooplankton biomass

The curve for zone 1-N is made with the results of the observations made at station M16 in 1974 (fig.2) . The results of the previous years fit well in the calculated confidence limits. We have observed two important peaks (max. beginning of May and mid-July) separated by a small depression . No peak was observed in September-October , as it was in the two other zones .

1.2.2. The qualitative composition and related quantitative aspects

Like in the zone 1-S , the different stages of copepods have their maximum at the same time . The general abundance is higher in zone 1-N . This confirms our hypothesis (Tech.Rep.1973/06 BIOL 03) on the estuarine zone (in the south of zone 1-N) being a hatchery for copepods .

1.3. Zone 2

1.3.1. Seasonal variations

The curve of fig.3 averages the results of stations M09 and M20 The values of the earlier years are slightly higher but for the peak in april-may.

1.3.2. The quantitative composition and related quantitative aspects

The peaks show less biomass per m^3 but are composed with the same species, at the same time than in the other zones.

2.First attempt of evaluation of the copepods production (spring time peak in the zone 1-3)

The zooplanktonic production could be evaluated taking into account the occurence time of the different developement stages.Hence, one could compute the transformation time from one stage to another,the biomass increase and the mortality.However, in our case, all the stages appear at the same time and in the three zones(see §1.1.2.),so that we cannot know the transformation times nor the mortality rate.

We however have tried some calculations,using different hypothesises. These will be further developed in a techn.report.

1)The increase of biomass observed at a single sampling station reflects the growth of the zooplankton.The mortality rate is taken as zero.

production	nauplii	37,8mg C/m^3	from 25-3	to 7-5-1974
	copepodites	57,4	"	"
grazing	nauplii	252	"	"
	copepodites	191	"	"

2)Developement of the populations taking water motion and spatial heterogeneity into account(see also chap.7a)

production	nauplii	20,2mg C/m^3	from 25-3	to 7-5-1974
	copepodites	2,6	"	"
grazing	nauplii	136	"	"
	copepodites	8,5	"	"

The discrepancies between the results of the two methods are important and some more investigations are needed.Themfore the calculations of production and grazing for 1974 are still made according to the method used in 1974 (see below)

3.Evaluation of the grazing of the herbivores in function of their individual weights

In situ measurements of grazing activity being not yet part of our routine activity,we have taken the same feeding figures as used in the previous report(PODAMO 1974)

a nauplius of copepods eats 140% of its weight/day
a copepodite " 110% "
an adult of copepods " 45% "
Tunicate " 65% "

Grazing figures are found in table I

4.Conclusions

The observations made during four years are reproductible.However,if one considers the more precise results of 1974,one may conclude that the variations are probably not only resulting from biological processes but from their combination with hydrodynamical factors.An attempt of discoupling is discussed at chapter 7.a.It logically leads to an evaluation of the production and grazing rates.Still,the difficulties involved in the estimation of eclosion and mortality rates must be overcome.Thus the method of calculation is still that used in the previous synthesis report:hence the average grazing figures are respectively 87,163 and 71 g $C/_{m^2 year}$ for Zones 1-S,1-N and 2.

Grazing mg C/m^3	Zone 1S	Zone 1N	Zone 2
January	119	45	17
February	42	40	58
March	30	45	68
April	720	837	542
May	2138	2407	602
June	694	1546	148
July	639	1731	246
August	459	876	186
September	582	366	210
October	132	126	174
November	248	67	87
December	1	60	45
Annual grazing			
gC/m^3 year	2,3 < 5,8 < 9,2	3,3 < 8,1 < 13	1 < 2,4 < 4
gC/m^2 year	35 < 87 < 140	65 < 163 < 260	28 < 71 < 112
gN/m^2 year	9,6 < 24 < 38,5	18 < 45 < 71,5	7,7 < 20 < 31

TABLE I

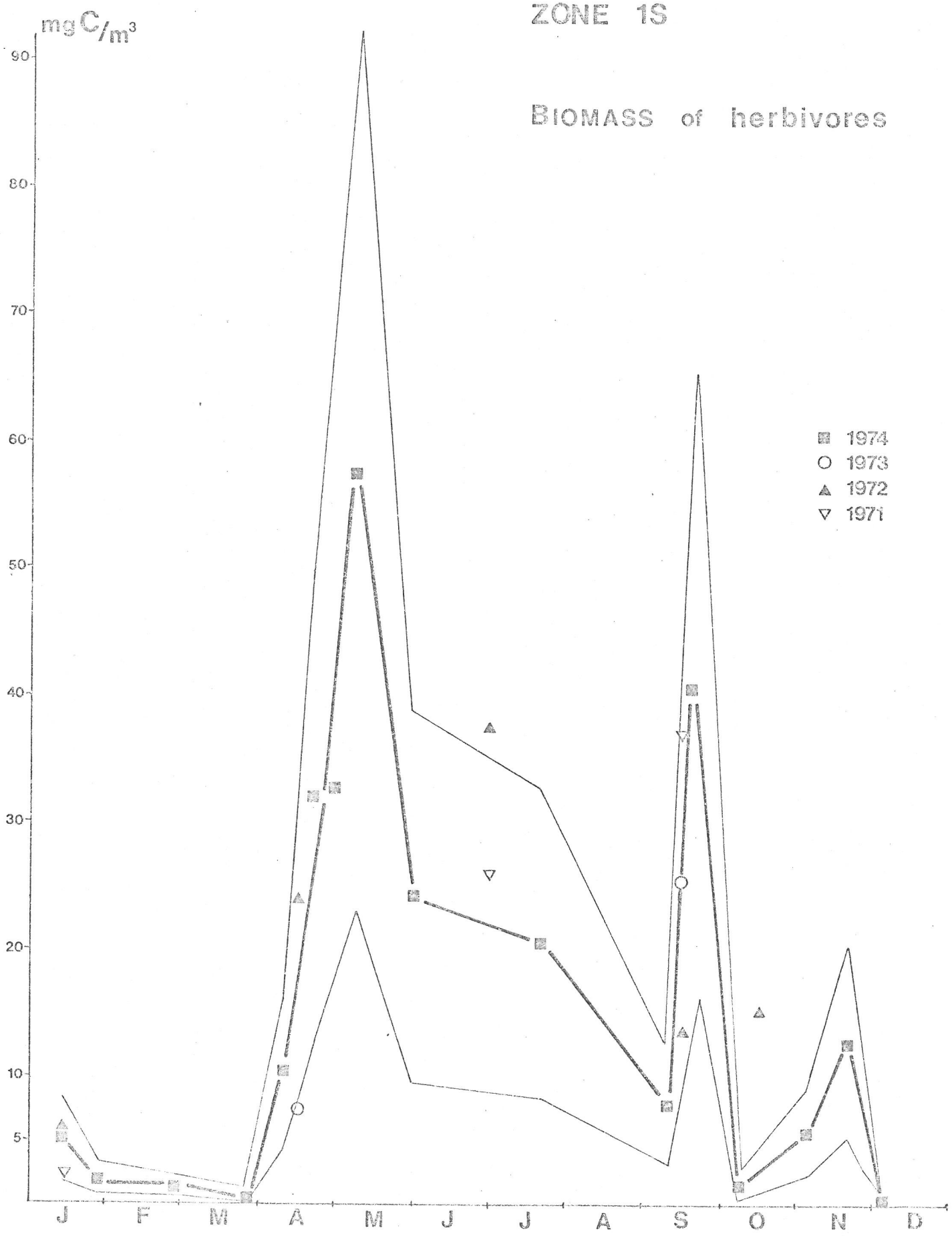
ZONE 1S
BIOMASS of herbivores
mg C/m³
90
80
70
60
50
40
30
20
10
5
1974
1973
1972
1971
J
F
M
A
M
J
J
A
S
O
N
D

fig. 1

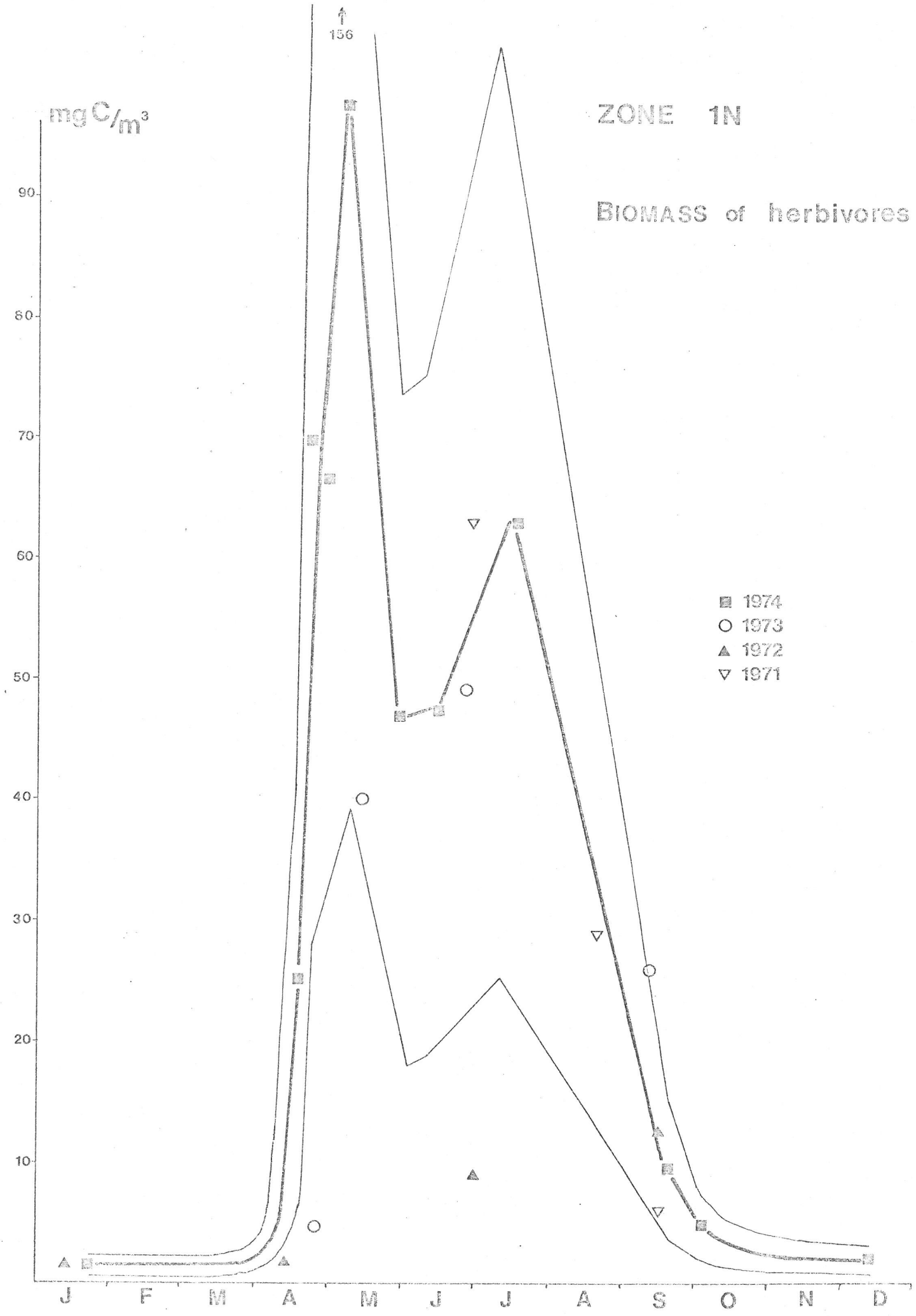
156
mg C/m³
ZONE 1N
BIOMASS of herbivores
90
80
70
60
50
40
30
20
10
1974
1973
1972
1971
J
F
M
A
M
J
J
A
S
O
N
D

fig.2

ZONE 2

BIOMASS of herbivors

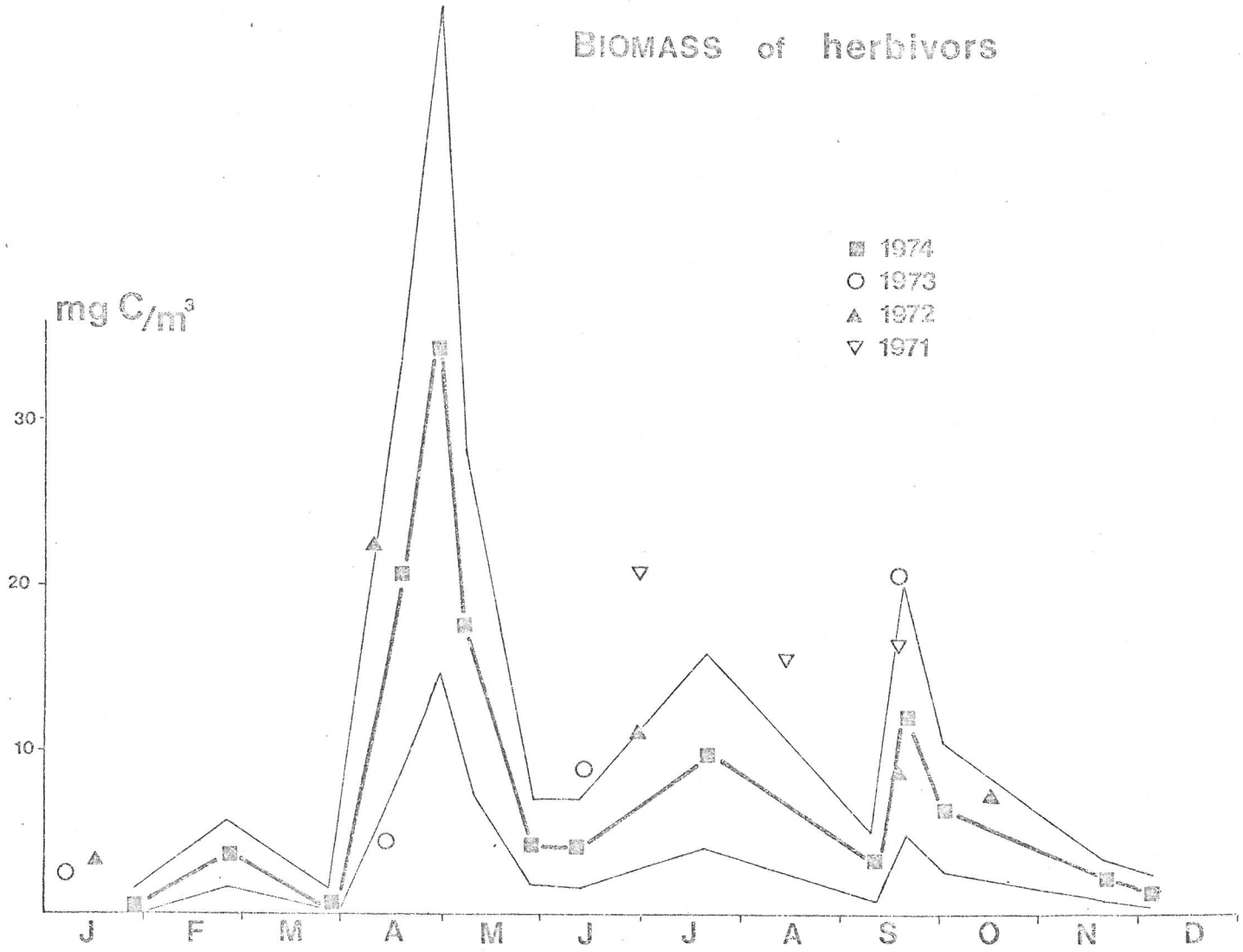

fig. 3

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